

IBM's Patterns for e-business

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Management Summary

At a time when the capture of experience through knowledge management is a high priority for many organisations, it is ironical that the IT industry as a whole pays little regard to the same issues. Consequently we see companies around the world duplicating effort and exposing themselves to unnecessary risks when implementing large systems on which the future of the business may rest. So it is with some relief that we see IBM embarking on a major project to categorise and document e-business systems architectures through its “Patterns for e-business” initiative. This is itself part of a larger work called the “Application Framework for e-business”, which addresses a wider set of issues such as design, development, integration, deployment, operation and management for web based applications. It should be stressed that this framework is based on open standards and not necessarily IBM proprietary platforms.

As the technology and services vendor with the most experience of implementing systems of all topologies, in a wide variety of organisations, IBM is perhaps the only candidate for an exercise of this kind. Microsoft simply does not have the large systems experience, Sun has a very narrowly defined technology set, and no other vendor comes anywhere near to qualifying for an exercise of this nature.

The benefits to be derived from this exercise are multiple, and best of all much of the information is currently available for free on IBM’s web site. Systems architects and designers will be the professionals who benefit most from this initiative, although it is the enterprise that benefits from reduced risks and cost savings through utilisation of this knowledge. These issues will become even more important over the next few years as systems architectures become more complex in response to the need for highly integrated, real-time corporate e-business applications. The complexity and variety of systems will ultimately expose businesses to unacceptable systems architecture risks, unless experience is gathered and abstracted as it is with the “Patterns for e-business” initiative.

Ultimately of course IBM would prefer users of this knowledge to utilise their technologies and services. However significant portions of this work provide templates that are independent of actual hardware and software used. The business and logical patterns make no mention of actual technologies used; it is only when considering some aspects of the design and the physical implementation that actual known solutions are presented as instantiations of a particular design. For IBM customers there are the obvious benefits of implementing tried and tested architectures, designs and physical solutions.

The real proof of the power of this work is demonstrated by the use IBM is itself making of the various aspects of it. Most significantly “Patterns for e-business” is being used as a tool to coordinate many of IBM’s sales and support activities. Sales of hardware, software and services are being coordinated around these patterns, allowing quite disparate parts of IBM’s operation to speak a common language. If IBM can benefit in this way then so can any other organisation.

These are early days for e-business and it seems likely that the ability to handle complexity, and deliver systems in a timely manner will ultimately become business critical factors; the “Patterns for e-business” initiative is a frontal assault on proliferating complexity and shrinking windows of opportunity, and management should at least investigate the potential it offers for their own businesses.

Introduction

The aim of this white paper is to give context to IBM's significant efforts to abstract patterns from the many systems implemented in diverse organisations throughout the world. It is not a technical paper; IBM has many technical documents that can be freely downloaded from the Internet (a list of URLs is given at the end of this document), and these provide all the technical documentation that might be required for those interested in the "Patterns for e-business" project.

The main aim of this paper is to show how e-business represents an order of magnitude increase in the complexity and sophistication of systems used by large organisations, and how the IBM initiative can help address associated problems. The most significant contributing factor to this complexity is the high degree of integration required by virtually all the systems that contribute to the basic act of buying and selling goods and services. This integration is not confined to systems within the enterprise, but increasingly includes systems belonging to trading partners, third party trading exchanges and perhaps most importantly those that face out to the customer. The old "build-as-you-go" paradigm that was in most instances quite adequate for building systems where complex integration issues were not important, is insufficient for the new breed of IT architectures where extensive internal and external integration is required.

Clearly there is a need for an "architectural language" for complex systems, and amongst other things this is what IBM's "Patterns for e-business" initiative provides. It follows that complex architectures suggest increasingly complex systems designs and physical implementations. This major initiative by IBM addresses both of these issues also, with detailed records of actual system designs and implementations that are known to work.

It is important to understand that the wealth of material associated with this project has not materialised overnight. Quite the contrary is true. The run-time topologies were derived from a 3 year IBM project called Enterprise Solution Structure, and the IBM RedBook "Patterns for e-business: User-to-Business Patterns for Topology 1 and 2 using WebSphere Advanced Edition" which deals with just a small subset of the application topologies is some 366 pages of detailed architectural, design and physical implementation analysis. Indeed there are some eight application topologies, and they move from the very simple, to the very complex as integration is sought with existing systems.

The complexity of web-based applications goes well beyond that of traditional enterprise systems. Security, systems management, interoperability, performance, availability and many other issues are amplified in importance as soon as systems face into the external world. This is compounded by a need to integrate with existing legacy applications for processing of core transactions and for other activities such as online cross selling. The array of technologies needed to address these issues is bewildering, and it is of course imperative that they all work together. This is why it is so important that "Patterns for e-business" addresses the runtime architectures with instantiations detailing actual products used. Simply knowing that a portfolio of products can work together is a highly valuable piece of information.

The Problem with e-business Applications

Implementing systems used to be a relatively straightforward matter. Typically a system would be contained within the enterprise and there would be a simple choice between buying a solution and building one. When things didn't go well on day one it didn't matter too much, since only internal employees got exposed to the problems. Today we see a whole new breed of e-business applications starting to emerge that introduce many new problems. The most significant of these are:

1. There is no longer a simple choice between buy and build. Systems architects and designers are faced with build, buy, rent, connect or any combination. Application Service Providers will undoubtedly come to host many of the "standard" applications companies use, giving the systems architect the option of renting. Similarly the emergence of third party market hubs for purchasing and supply chain means there is a real need to connect.
2. There is no room for error with systems that face into the external world. The consequence of errors and downtime with applications that interface to customers and trading partners are often major, and simply cannot be tolerated. E-business systems have to hold water from day one.
3. It is often stated that Internet time runs several times faster than normal time. Windows of e-business opportunity appear with little notice and might last for less than a year. Speed of response is critical. If calling on accumulated experience means that a system is delivered significantly faster, then the business benefit will probably be very significant.
4. Skills are in short supply and experience even more so. There is clearly a need for a knowledge base that would allow architects and designers with limited skill to make decisions with confidence.
5. e-business application development technologies are more complex and require very high levels of skill. The complexity of tasks means that Java and C++ are essential tools, and reuse of design components would reduce workloads considerably.
6. The number of issues that systems need to address has become much larger. This includes availability, security, systems management, extensive integration with other systems, and increased application complexity. Getting the diverse set of technologies that are needed to address these issues to work together can be a costly form of Russian Roulette.

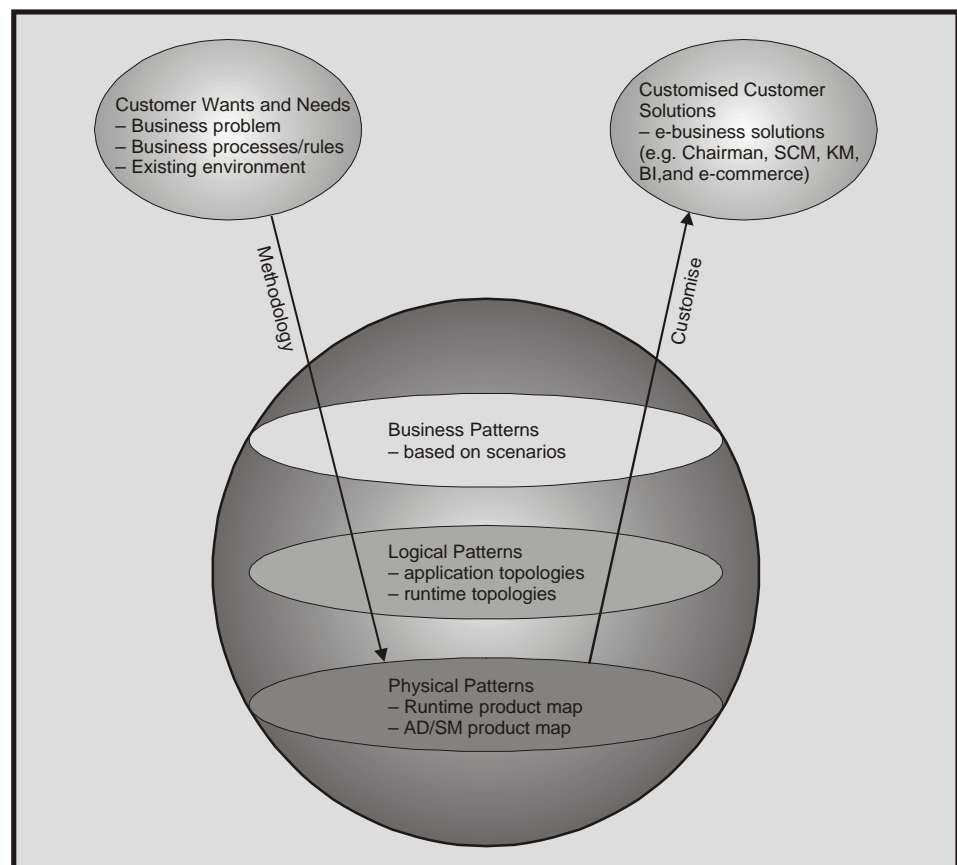
Clearly there is less room for systems architects and designers to "do their own thing", when the stakes are so high. Just as many other areas of business are using benchmarking and best-practice to establish a starting point for their activities, so IT professionals increasingly need a set of architectural and design "best-practices" as a starting point for their activities. In many respects this is how "Patterns for e-business" can be viewed, although it also provides tools to clarify thinking.

Overall Structure

The three major layers of analysis in the “Patterns for e-business” project are:

1. Business patterns – these categorise applications by the nature of the interaction taking place. For example “user-business” is one such pattern, and it deals with users, both internal and external, who might interact directly with the enterprise. The obvious complement to this is “business-business”, and here IBM has created the two sub-categories of B2Bi, which covers direct interaction, and B2M2B which covers interaction through intermediary marketplaces. These patterns help clarify thinking considerably, and lead naturally to the next level of patterns.
2. Logical patterns define application and runtime architectures. IBM has so far defined eight logical patterns for the user-business pattern, and they provide a high level architectural view of where various layers (presentation, application, data) are positioned. The runtime architectures detail runtime technologies (but not products) needed to support a given application technology.
3. Physical patterns give details of actual instantiations of runtime topologies. It is here that actual products are specified, providing details of configurations that are known to work.

This structure appears to be primarily top-down in nature. However in reality it is iterative, in the sense that moving from business patterns to logical patterns to physical patterns implies a modification of business and logical patterns due to runtime constraints and requirements. As such the patterns at all levels represent a starting point, to be modified as required to fit particular needs.



Business Patterns

The requirements a system has to satisfy depend very much on the sources of input, and the destinations for data. These requirements are concerned with availability, security, performance and a myriad other factors. Through Business Patterns IBM has provided a high level of abstraction that aids thought when thinking about systems architecture. The inputs may be from online users, applications within the enterprise, or applications that are executing in other businesses.

Business patterns represent the highest level of abstraction, and a particular business pattern implies many properties of a system that become more manifest as we drop down through logical and runtime patterns.

IBM has so far created 6 business patterns. These are:

1. User to Business – represents the general case of users accessing a system both internally and externally, with the exception of users involved in online buying. As such it covers transactions involving goods and services that cannot be listed or sold from a catalogue.
2. User to Online Buying – is a special case of the User to Business pattern, where goods are sold directly to online buyers or consumers, typically through a catalogue.
3. Business to Business – covers two types of inter-business activity (intra business to business is covered by application integration below).
 - a. B2Bi covers programmatic links between two or more business. A good example of this is supply chain management.
 - b. B2M2B covers eMarketPlace environments where an intermediary provides some form of trading hub or exchange. This interaction may take place online or programmatically.
4. User to User – covers direct interaction between users, such as e-mail and workflow.
5. User to Data – describes the use of data (structured, video, voice, graphics etc) for analysis. This is primarily the province of Knowledge Management and Business Intelligence.
6. Application Integration – links different applications within a business so that data and processes can be shared.

Application Topologies

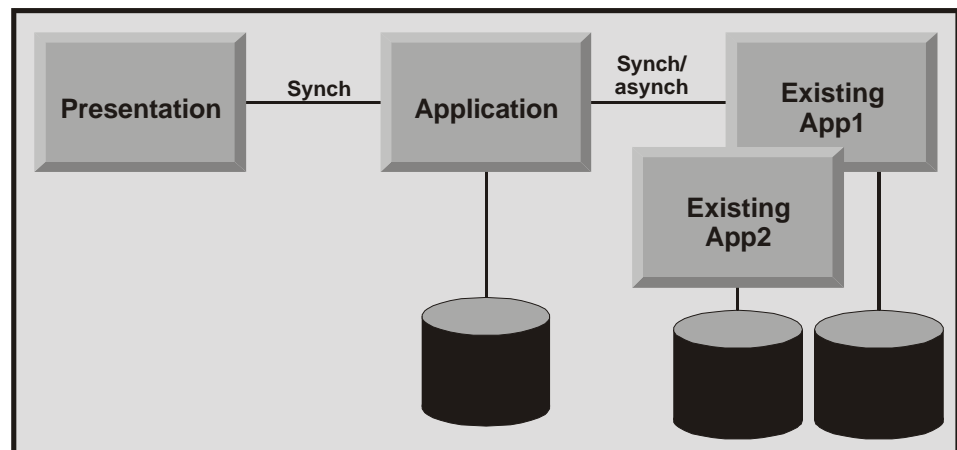
Perhaps the most powerful element of this work is the application topologies, which are high level abstractions giving insights into many system architectures. Eight such topologies have been analysed for the user-business Business Pattern, moving from the simple to the complex with well-defined increments in sophistication. The following description is not exhaustive and is given merely to give a flavour of the issues these topologies address.

Web-Up Topologies

The first two topologies are described as “Web-Up” in nature. This means they address web-centric applications for a single web channel, including web-browser and data that is replicated from existing databases or created by users of the web.

The first topology addresses the scalability problems of client/server architectures used in many web-centric applications and introduces independence from the presentation layer.

The second topology is shown below and is an extension of the first, supporting integration between front-end e-commerce and back-end legacy applications.



Enterprise Out Topologies

The following application architectures are termed Enterprise-Out, signifying applications that grow from the enterprise outwards. These deal with user-business patterns where two or more channels are considered. This leads to the third topology, which represents a very thin client (maybe a terminal emulator or Host on Demand) accessing existing applications. The basic purpose of applications of this nature is to provide access to applications without having to re-engineer them.

Topology four embraces a thin client (e.g. using a CICS ECI bean or a CICS Java gateway) accessing existing applications. This provides customized presentation of existing centralized applications without having to re-engineer.

Topology five is a topology used to implement web-enabled existing applications that are highly robust and scalable.

Topology six adds to topology five by allowing the enterprise to make the third tier applications seamless by integrating the business logic at the intermediate tier. This architecture will support multiple types of thin client with a common intermediate tier.

At a business level this type of architecture provides customer-oriented support systems rather than product-oriented systems.

Topology seven enhances topology six by supporting mass customization. This is implemented through extensive integration of web based interface and core enterprise systems. For example, someone enquiring on the status of an order may be prompted for cross-selling opportunities after central databases have been interrogated (giving age, birthdays etc).

Topology eight separates customer relationship (CRM) from line-of-business (LOB) data such that the virtual enterprise becomes more of a reality.

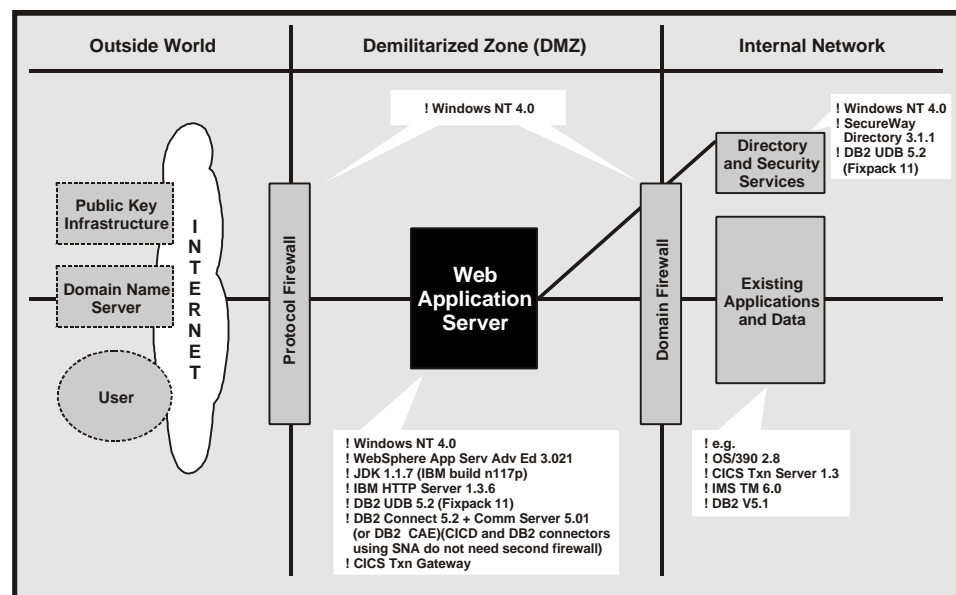
These logical topologies are worthy of a much fuller treatment, and systems architects and designers would benefit very considerably from investigating them more thoroughly.

Runtime Topologies

The runtime topologies bring the logical topologies nearer to a working reality by specifying runtime technologies needed to make them work. It has to be stressed that products are not specified at this stage, but types of technology such as transactional servers, security services and others.

Physical Patterns

The final leg in all of this is the actual instantiation. Multiple physical patterns can be produced using the same products from the Application Framework for e-business but using different platforms.



Other Initiatives

A number of other initiatives exist in the market that attempt to address the same issues as those addressed by “Patterns for e-business”. The main contenders are large hardware companies such as HP and Sun, although one should not be too surprised to find Microsoft claiming this territory also. Perhaps the contender that can be dismissed most immediately is ECO initiative by EMC, Cisco and Oracle. Not surprisingly this focuses on storage, networks and databases, and is in no way equal to the effort by IBM.

Sun’s initiative, Java 2 Platform, Enterprise Edition (J2EE) Blueprints focuses on the development and deployment of applications using the J2EE platform. This is obviously limited in terms of the technologies addressed, and does not address broader issues such as systems management and availability. Again this initiative is no match for the breadth and scope of IBM’s Patterns for e-business.

Microsoft’s attempts in this area are spearheaded by what have become known as the Duwamish Books. These concentrate on templates that are based around Microsoft technologies in the main, but do not embrace the complex architectures or technologies required to make them work in the same way as the IBM initiative.

Finally HP has some useful documentation on systems architectures and the tools and practices that other users have found useful. Clearly this will be helpful, but it is currently quite narrow in focus and only in its very early days.

As far as Butler Group is aware the IBM initiative is unique in its scope and knowledge base, and providing IBM can adhere to its principle of embracing open standards, we are quite sure that there will be no real competition.

Summary

There is great potential in Patterns for e-business, and indeed there is already a considerable knowledge base that designers and systems architects can call upon. The only real threat to this is the obvious temptation for IBM to populate physical instantiations with IBM technologies in preference to others. If this were to happen the project would lose much of the value it could have, and IBM would lose out as a leader in thinking on design and architecture re-use.

As things stand today, any designer or systems architect can access the Patterns for e-business knowledge base and access information that could well mean the difference between success and failure in large e-business projects. There is nothing to lose by accessing the models, architectures and knowledge that form the content of this project. “Patterns for e-business” is a unique resource that anyone can access for free, and those with the foresight to use it will at a minimum reduce the risk and cost of implementing systems, and may possibly deliver real competitive advantage to their business.

Web Addresses

The main web site for Patterns for e-business documentation is:
<http://www-4.ibm.com/software/developer/web/patterns>

Website for the Application Framework for e-business is:
<http://www.ibm.com/software/ebusiness/>

Patterns for e-business: User-to-Business Patterns for Topology 1 and 2 using WebSphere Advanced Edition, SG24-5864 can be found at:
<http://www.redbooks.ibm.com/abstracts/sg245864.html>

WebSphere Studio and VisualAge for Java Servlet and JSP Programming,SG24-5755 can be found at:
<http://www.redbooks.ibm.com/abstracts/sg245755.html>

Servlet/JSP/EJB Design and Implementation Guide for IBM WebSphere Application Servers, G24-5754 can be found at:
<http://www.redbooks.ibm.com/redpieces/abstracts/sg245754.html>

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